

CLAIMS

1. Process for producing pellets of a nuclear fuel based on a uranium and plutonium mixed oxide or a uranium and thorium mixed oxide having a specified plutonium or thorium content, the said process comprising the following steps:

a) preparing a primary mixture of powders having a plutonium or thorium content greater than the specified content of the fuel, by co-milling a UO_2 powder P1 and a PuO_2 or ThO_2 powder P2,

b) sieving the primary mixture of powders,

c) preparing a final mixture of powders having the specified plutonium or thorium content of the fuel by mixing the undersize obtained in step b) with a UO_2 powder P3 and, optionally, one or more additives,

d) pelleting the final mixture of powders obtained in this way, and

e) sintering the pellets obtained, and being characterized in that at least one compound chosen from the group consisting of the oxides of chromium, aluminium, titanium, magnesium, vanadium and niobium, precursors thereof and inorganic compounds capable of providing the element sulphur during step e), is/are incorporated in at least one of the powders P1, P2 and P3 and/or into at least one of the primary or final mixtures of powders.

2. Process according to Claim 1, characterized in that the compound is chromium sesquioxide (Cr_2O_3) or a precursor thereof.

3. Process according to Claim 2, characterized in that, the compound being Cr_2O_3 , the mass content of Cr_2O_3 in the final mixture of powders is 500 to 5000 ppm, preferably 1500 to 3000 ppm.

4. Process according to Claim 1, characterized in that the compound is an inorganic compound capable of providing the element sulphur during step e) ..

5. Process according to Claim 4, characterized in that the mass content of the final mixture of powders is composed such that it enables 50 to 2000 ppm of elementary sulphur to be provided, preferably 50 to 1000 ppm of elementary sulphur.

6. Process according to Claim 5, characterized in that the compound is uranium oxysulphide (UOS).

7. Process according to Claim 6, characterized in that the mass content in UOS of the final mixture of powders is 440 to 18000 ppm, preferably 440 to 9000 ppm.

8. Process according to Claim 1, characterized in that all or part of the compound is incorporated in the primary mixture of powders during step a) or between step a) and step b).

9. Process according to Claim 1 characterized in that all or part of the compound is incorporated in the final mixture of powders during step c).

10. Process according to Claim 1, characterized in that the compound is used in powdered form.

11. Process according to Claim 1, characterized in that the mass content in plutonium or thorium of the primary mixture of powders is 25 to 35%.

12. Process according to Claim 1, characterized in that the mass content in plutonium or thorium of the final mixture of powders is 3 to 12%.

13. Process according to Claim 1, characterized in that chamotte is added to the primary mixture of powders and/or to the final mixture of powders.

14. Process according to Claim 1, characterized in that the additive or additives mixed with the undersize during step c) is/are chosen from lubricating agents or porogenic agents.

15. Process according to Claim 1, characterized in that the pellets are preferably sintered at a temperature of 1700°C in a gaseous atmosphere leading to an oxygen potential ΔG_{O_2} of -476 to -372 KJ/mol at the sintering temperature.

16. Process according to Claim 14, characterized in that the gaseous mixture is a humidified mixture of argon and hydrogen containing 5% hydrogen and of which the water content is from 100 to 2500 ppm.

17. Pellet of a nuclear fuel based on a uranium

and plutonium mixed oxide or a uranium and thorium mixed oxide, capable of being obtained by a process according to Claim 1.